**Must-Knows: Unit 7 (Cell Signaling)**

Ms. Ottolini, AP Biology

**Test Format:** 17 multiple choice questions, 1 short answer question

***Directions:*** *To prepare for your upcoming test, please answer the following questions thoroughly and accurately on your answer sheet in the column titled “Your Answer Before Checking the Answer Key.” Then, check the answer key (posted on Ms. Ottolini’s wiki page). Finally, record any additions / changes to your answer in the column titled “Changes / Additions to Your Answer After Checking the Answer Key”*

**Topic #1: The Basics of Cell Signaling**

**Learning Target #1:** You will be able to describe what happens in each of the three main steps of cell signaling—reception, transduction, and response—and provide examples of each.

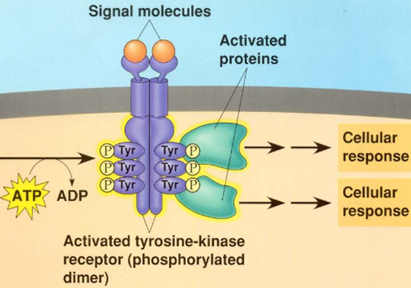
**Learning Target #2:** You will be able to compare/contrast cell signaling between cells that are connected, cells that are separated by a small distance, and cells that are separated by a large distance.

**Learning Target #3:** You will be able to compare the purpose of cell signaling in unicellular vs. multicellular organisms and provide examples of each.

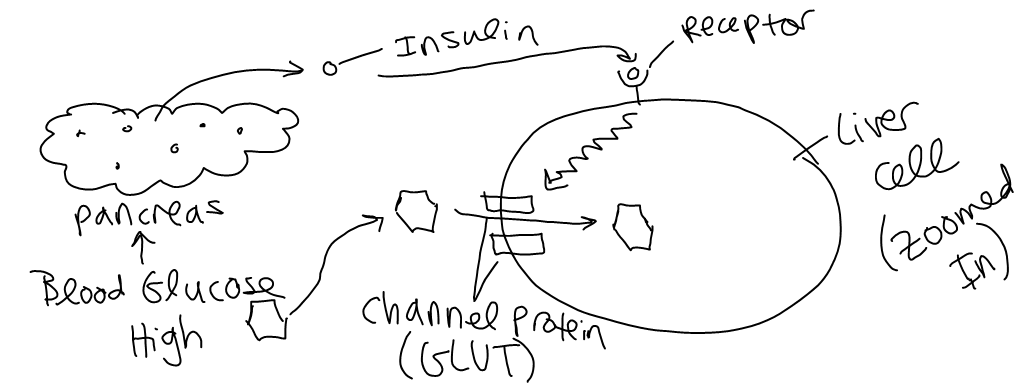
**Learning Target #4:** You will be able to predict the effects of changes in cell signaling pathways.

**Topic #2: Mitosis**

1. A small, nonpolar signal molecule is sent to a target cell. What type of receptor is used (intracellular vs. plasma membrane) and what type of response occurs (cytoplasmic vs. nuclear)? Explain your answers.
2. A large, polar signal molecule is sent to a target cell. What type of receptor is used (intracellular vs. plasma membrane) and what type of response occurs (cytoplasmic vs. nuclear)? Explain your answers.
3. Provide an example of cell signaling by direct contact in either animals or plants. What are the pros and cons of using this method of signaling?
4. The endocrine system is used for signaling across long distances. What are the pros and cons of using this method of cell signaling?
5. In class, we learned about the epinephrine signaling pathway involved in the fight or flight response. If the second messenger molecule cyclic AMP (cAMP) cannot be created during the transduction step of this pathway, what will be the final effect on the signaling pathway?

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1. If ATP is not present in the cell pictured to the right, what would be the most immediate effect on the receptor tyrosine kinase pathway?
2. Explain how insulin is used in the pathway pictured below to lower blood glucose.



**Topic #2: The Nervous System**

**Learning Target #5:** You will be able to identify the main parts of the human nervous system.

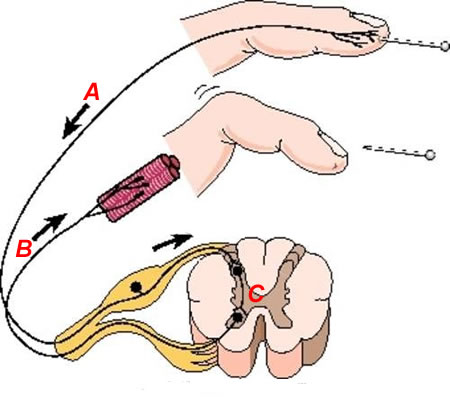
**Learning Target #6:** You will be able to outline the steps involved in a reflex arc.

**Learning Target #7:** You will be able to identify the parts of a neuron and their functions.

**Learning Target #8:** You will be able to describe the movement of a signal (action potential) down the length of a single neuron.

**Learning Target #9:** You will be able to describe the movement of a signal from one neuron to another.

**Topic #4: Regulation of the Cell Cycle**

1. Identify the neurons involved in the polysynaptic reflex arc pictured to the right and explain how they interact to produce a response to the stimulus.
2. How is an excitatory neurotransmitter different from an inhibitory neurotransmitter?
3. What is the role of Schwann cells in nerve signaling?
4. Which ion channels are involved in the depolarization phase of the action potential? How does the opening of these channels affect the membrane potential inside the neuron?
5. Which ion channels are involved in the repolarization phase of the action potential? How does the opening of these channels affect the membrane potential inside the neuron?
6. How do nerve cells reach threshold potential (-55 mV)? What happens when a nerve cell reaches threshold?
7. List the steps involved in the transmission of a signal across a synapse. Start from the wave of depolarization (the action potential) reaching the presynaptic neuron’s axon terminal. End with the postsynaptic neuron reaching threshold potential.

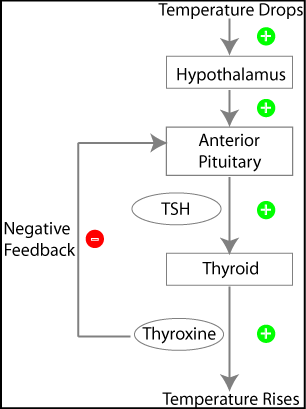
**Topic #3: The Endocrine System**

**Learning Target #10:** You will be able to describe how the secretion of a single hormone from a gland can result in multiple responses in the body.

**Learning Target #11:** You will be able to compare / contrast the different types of hormone molecules.

**Learning Target #12:** You will be able to explain how various hormones are used in positive and negative feedback loops.

1. When the concentration of solutes in the blood (blood osmolarity) is high, the pituitary gland releases antidiuretic hormone (ADH). ADH stimulates the kidneys to reabsorb water in order to increase blood volume and decrease blood osmolarity. When the kidneys reabsorb water, this causes the urine to be extremely concentrated (i.e. have a low water content).

Ms. Ottolini overhydrates in preparation for a big race (yeah right, she is far too lazy for this!). How will her body respond to this massive intake of water, which results in a high blood volume?

1. The hypothalamus and pituitary release hormones to stimulate the thyroid gland to create thyroxine, a hormone that speeds up metabolism. How does the production of thyroxine affect the hypothalamus and pituitary? Is this an example of positive or negative feedback? Why?
2. Let’s say the hormone oxytocin causes uterine contractions during mammalian labor. The uterine contractions, in turn, cause the release of more oxytocin, which causes even stronger contractions. Is this an example of positive or negative feedback? Why?
3. When your blood calcium levels are too high, the hormone calcitonin causes the absorption of excess calcium into the bones, lowering the level of calcium in the blood. Is this an example of positive or negative feedback? Why?